

REMARKS

By this Amendment, Claims 1, 7, 8, and 41 are amended, Claim 2 is canceled, and no new claims are added.

I. Claim Rejections - 35 U.S.C. §112

The Examiner has rejected Claim 2 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner rejects Claim 2 stating that: “The term "small resist foot" is not defined in the specification and is a relative term.”

The Applicants have canceled Claim 2 making this “35 U.S.C. 112, second paragraph” rejection of Claim 2 moot.

II. Claim Rejections - 35 U.S.C. §103

The Examiner has rejected Claim 41 under 35 U.S.C. 103(a) as being unpatentable over M. Angeopoulos et al (U. S. Patent: 6316167, here after 167), further in view of Alfred Grill et al (U. S. Patent: 6497963, here after 963).

The Examiner has rejected Claim 41 stating that “167 teaches a method for depositing a material on a substrate, the method comprising:

Placing a substrate in a chamber having plasma source and on a substrate holder [column 9 line 65];

Depositing (tunable) layers of materials on the surface [fig. 28]. Depositing a first portion of a TERA layer on the substrate, wherein a first processing gas comprising first precursor is provided to the chamber (the deposition is via PECVD, therefore it is inside a chamber) [column 9 lines 65-68] and depositing a second processing gas comprising a second precursor is provided to the chamber, wherein the second precursor is chosen to reduce reaction with a photoresist [column 10 lines 7-9, column 10 lines 53-57]. 167 teaches performing discharge sequence (plasma process for the next layer, fig. 28) wherein a bias voltage is provided during a pin up process (the substrate is inherently on a substrate holder) [column 9 lines 4-10]. 167 does not teach the bias

source is a RF source. 963 teaches a method of depositing SiCH film via plasma process [abstract, column 6 lines 35-37], where the gas precursor is trimethylsilane [column 6 line 15], and the bias to the substrate is via a RF source [column 5 lines 23-25]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer as 167 teaches, where the bias source is a radio frequency source as 963 teaches, because 963 teaches it is suitable to have a radio frequency to provide bias to substrate for deposition SiCH film.”

The Applicants have amended Claim 41 to more clearly recite the invention and believe this “35 U.S.C. 103(a)” rejection of Claim 41 should be withdrawn because amended Claim 41 is patentable over 167 and 963.

The Applicants believe that the cited art does not teach, suggest, or motivate a method that comprises:

“A method for depositing a material on a substrate, the method comprising: placing a substrate in a chamber having a plasma source and on a substrate holder; depositing a first portion of a Tunable Etch Resistant ARC (TERA) layer on the substrate, wherein a first processing gas comprising a first precursor is provided to the chamber;

depositing a second portion of the TERA layer on the first portion of the TERA layer, wherein a second processing gas comprising a second precursor is provided to the chamber, wherein the second precursor is chosen to reduce reaction with a photoresist; and

performing a pin up process, wherein a RF signal is provided during at least a portion of the pin up process, and one or more lift pins are extended to lift the substrate off the substrate holder during the pin up process.”

The Examiner has rejected Claims 1- 9, 13-17, 20- 21, 23-24, 27-29, and 31-36 under 35 U.S.C. 103(a) as being unpatentable over M. Angeopoulos et al (U. S. Patent: 6316167, here after 167), further in view of Shyh-Dar Lee et al (U. S. Patent Application: 2003/0228750, here after Lee), Kamal Kishore Goundar et al (U. S. Patent Application: 2004/0147115, here after 115), and Alfred Grill et al (U. S. Patent: 6497963, here after 963).

The Examiner states that:

“167 teaches, a method for depositing a material on a substrate, comprises, placing a substrate in a chamber having a plasma source and on a substrate holder [column 9 line 65], wherein the deposition further comprises; flowing a precursor into the chamber at a constant flow rate [column 9 lines 5-7] where the chamber pressure is constant (200 mtorr) [column 9 line 8], and depositing a top layer of (TERA) layer [column 12 lines 57-62]. 167 teaches performing discharge sequence (plasma process for the next layer, fig. 28) wherein a bias voltage is provided during a pin up process (the substrate is inherently on a substrate holder) [column 9 lines 4-10]. 167 also teaches the precursor is tetramethylsilane. The fact that the processing gas (tetramethylsilane) is not amine-based precursor (as is disclosed in 0046 of application the amine based precursor react with resist), and in fact the applicant use this precursor [0055 line 11]). Therefore, the precursor chosen to reduce reaction with a photoresist. 167 does not teach the precursor is provided to the chamber with an inert gas and also does not specifically teach the detail of the deposition process. Lee teaches a method of deposition a low dielectric layer from a plasma treatment of reaction gas comprising tertamethylsilane and C02 (inert gas) to form SiCH layer [abstract, 0013]. Lee also teaches the flow rates of the tetramethylsilane and carbon dioxide is different in the chamber [0021]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer as 167 teaches where deposition of the TERA layer (SiCH) is comprising flowing an inert precursor gas into the chamber with flowing rate different than the flowing rate of tetramethylsilane as Lee teaches, because Lee teaches it is suitable to deposit SiCH layer with tetramethylsilane precursor and an inert gas. It is also obvious as the pressure of the chamber was 200 mtorr, by flowing the inert gas the chamber pressure would change and it is necessary to perform a stabilization process to achieve substantially constant pressure prior to deposition process to obtain a uniform coating. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer as 167 teaches where deposition of the TERA layer "(SiCH) as 167 and Lee teaches where the chamber pressure is stabilized prior to deposition the TERA layer, because it is necessary to obtain a

uniform coating. Neither of the above references teaches a purging process before and after discharge process. 115 teaches a method of forming a SiCH film via plasma reaction of tetramethylsilane gas and inert gas [abstract, 0056-0057], and 115 also teaches after deposition a purging step removes the volatile matters from decomposition from the reaction chamber [0070]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer as 167 and Lee teach, where after each deposition step a purging process perform to remove the contamination from the chamber, because 115 teaches it is suitable to remove contamination from the chamber with purging process. None of the above references teaches the bias source is a RF source. 963 teaches a method of depositing SiCH film via plasma process [abstract, column 6 lines 35-37], where the gas precursor is trimethylsilane [column 6 line 15], and the bias to the substrate is via a RF source [column 5 lines 23-25]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer as 167, Lee, and 115 teach, where the bias source is a radio frequency source as 963 teaches, because 963 teaches it is suitable to have radio frequency to provide bias to substrate for deposition SiCH film.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe this “35 U.S.C. 103(a)” rejection of Claim 1 should be withdrawn because amended Claim 1 is patentable over 167 in view of Lee, 115, and 963.

The Applicants believe that the cited art does not teach, suggest, or motivate a method that comprises:

depositing a Tunable Etch Resistant ARC (TERA) layer on the substrate,
wherein the depositing further comprises:

flowing a precursor and an inert gas into the chamber at different flow rates, the chamber being at a first pressure;

establishing a different flow rate for the inert gas and a different chamber pressure;

performing a stabilization process, wherein the flow rate of the precursor, the flow rate of the inert gas, and the chamber pressure are held substantially constant;

depositing a top layer of the TERA layer;

performing a purging process;
performing a discharge sequence, wherein an RF signal is provided during a pin up process, and one or more lift pins are extended to lift the substrate off the substrate holder during the pin up process; and
performing second purging process, wherein the precursor is chosen to reduce reaction with a photoresist.

The Examiner has rejected Claim 2 asserting that:

“167, Lee and 115 teach the limitation of claim 1, since the application is to fabricate IC's and in nm size, [167 ref. column 1 lines 1-3, column 1 lines 29...33], therefore the photoresist features should be about nm and are very small (also please see column 5 lines 10-13).”

The Applicants have canceled Claim 2 rendering the rejection of Claim 2 moot.

The Examiner has rejected Claim 3 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1, and 167 teaches forming plurality of photoresist features on the photoresist compatible surface and she further teaches the feature comprises a well defined rectangle profile [fig. 10].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 3 should be withdrawn because Claim 3 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 4 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1, and 167 teaches the same precursor to form the TERA layer as the applicant use (tetramethylsilane) [column 8 line 60] underneath the photoresist layer, therefore it is inherent that it matches (reduce chemical reaction) with the resist and prevent formation of footings on the photoresist features [fig. 8 and column 5 lines 10-13] and the photoresist on the top portion also has rectangular profile [fig. 8].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 4 should be withdrawn because Claim 4 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 5 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1, and 167 further teaches isolating a bottom portion(layer 1) of the TERA layer from the photoresist with a top portion of the TERA layer(layer 3) [fig. 28], thereby reducing the formation of footing on photoresist features in a photoresist layer [fig. 8, column 5 lines 10-13].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 5 should be withdrawn because Claim 5 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 6 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1, and 167 further teaches providing a chemically inactive layer (TERA layer) between a chemically active layer (the substrate or the silicon dioxide layer) [column 8 line 37] and a photoresist layer [fig. 28], wherein the precursor is chosen to create a dielectric material (SiCH) [column 8 line s 57-60] that does not chemically react with the photoresist layer.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 6 should be withdrawn because Claim 6 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 7 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1, and 167 further teaches the top portion of the TERA layer have a chemically inert surface [SiCH, column 10 lines 54-56] with plurality of rectangular photoresist features [Fig. 8].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 7 should be withdrawn because Claim 7 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 8 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1, and 167 further teaches there is no chemical interaction and therefore resist poisoning [column 10 lines 45-49]

between the TERA layer [column 10 lines 54-56] and plurality of photoresist features having substantially rectangular profiles can be formed on the TERA layer [fig. 8].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 8 should be withdrawn because Claim 8 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 9 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1, and 167 further teaches, a method of depositing material on a substrate wherein the depositing TERA layer during a depositing time comprises a material having a refractive index (n) of 2.1 and extinction coefficient of 0.5 [column 12 line 58-59, first layer] measured at the wavelength of 248 nm [column 12 lines 30 and 64].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 9 should be withdrawn because Claim 9 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claims 13 and 24 asserting that:

“167, Lee, 115, and 963 teach the limitation of claims 9 and 24. 963 also teaches the RF source frequency is 13.56 MHz and power of 9 watts [column 6 lines 15-21]. A prima facie case of obviousness exists where the claimed ranges and prior art do not overlap but are close enough that one in ordinary skill in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 f.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See MPEP 2144.05. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer in which the plasma source has a RF source as 963 teaches because the claimed ranges and prior art do not overlap but are close enough that one in ordinary skill in the art would have expected them to have the same properties.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claims 13 and 24 should be withdrawn

because Claims 13 and 24 are dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 14 asserting that:

“167, Lee, 115, and 963 teach the imitation of claim 13 as discussed above and 167 further teaches a method of deposition a TERA layer (comprises Si, C, O, H) [column 4 lines 12~24] on a substrate which meets the limitation of claims 1 and 10 as discussed above. 963 also teaches the RF source frequency is 13.56 MHz and power of 9 watts [column 6 lines 15-21]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer in which the plasma source has a RF has the power of 9 watts and frequency of 13.56 MHz, because 963 teaches it is suitable to deposit TERA layer with having RF plasma source.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 14 should be withdrawn because Claim 14 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claims 15 and 17 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 9, 167 teaches another process gas comprises silicon and carbon containing precursor (tetramethylsilane, 4MS) [column 8 line 60]. Since 167 teaches depositing top and bottom part of TERA layer, the precursor can be chose independent from each other. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer where the bottom part is depositing by tetramethylsilane precursor and the top portion is deposited by trimethylsilane precursor, because 167 teaches it is suitable to deposit the TERA layer with these precursors.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claims 15 and 17 should be withdrawn because Claims 15 and 17 are dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 16 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 15; Lee teaches silicon containing and carbon containing precursor with the rate of 500-2500 sccm [column 8 line 60]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer as 167 teaches where the flow rate of the gases are based on what Lee teaches, because as Lee teaches it is suitable flow rate range for gases to deposit SiCH layer.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 16 should be withdrawn because Claim 16 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claims 20 and 21 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1, and 167 teaches controlling the pressure of the chamber and the pressure in the range of 0.2 torr [column 8 line 61].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claims 20 and 21 should be withdrawn because Claims 20 and 21 are dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 23 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1, and 167 further teaches depositing a top portion of the TERA layer, wherein the top portion comprises a material having a refractive index of 1.9 and extinction coefficient of 0.25, when measured at a wavelength of 248 nm [column 12 line 61].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 23 should be withdrawn because Claim 23 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claims 27 and 28 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 23, 167 further teaches the process gas includes silicon containing precursor, carbon containing gas, oxygen

[column 8 lines 66-67, column 9 lines 7],and Lee teaches the processing gas includes inert gas(CO₂) [0013].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claims 27 and 28 should be withdrawn because Claims 27 and 28 are dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 29 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 27. Lee teaches the precursor is flowed at rate of 500-2500 and the inert gas flowed with the rate of 500-1500scm [0021 last 4 lines]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer as 167 teaches where the flow rate of the gases are based on what Lee teaches, because as Lee teaches it is suitable flow rate range for gases to deposit SiCH layer.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 29 should be withdrawn because Claim 29 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 31 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 27 as discussed above and Lee teaches the inert gas(CO₂) comprises oxygen. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer as 167 teaches where the inert gas is carbon dioxide, because as 115 teaches it is suitable to form a TERA layer with tetramethylsilane and carbon dioxide.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 31 should be withdrawn because Claim 31 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 32 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 28 and 167 teaches the processing gas comprises tetramethylsilane (4MS) [column 8 line 60].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 32 should be withdrawn because Claim 32 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 33 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 32, and 167 teaches controlling the chamber pressure to be lower than 3 torr [column 8 line 58].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 33 should be withdrawn because Claim 33 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claims 34 and 35 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 33, and 167 further teaches depositing the TERA layer (top portion) comprises controlling the temperature of the substrate to greater than 300 C [column 10 lines 1-2].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claims 34 and 35 should be withdrawn because Claims 34 and 35 are dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claim 36 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 32, and 167 further teaches controlling the substrate temperature at 60°C [column 8 line 62].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 36 should be withdrawn because Claim 36 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, and 963.

The Examiner has rejected Claims 10-12, 18, and 25-26 under 35 U.S.C. 103(a) as being unpatentable over M. Angeopoulos et al (U. S. Patent: 6316167, here after 167), Shyh-Dar Lee et al (U. S. Patent Application: 2003/0228750, here after Lee), Kamal

Kishore Goundar et al (U. S. Patent Application: 2004/0147115, here after 115), a Alfred Grill et al (U. S. Patent: 6497963, here after 963), as applied to claim '1 above, further in view of Houn T. Nguyen et. al. (U. S. Patent application: 2003/0017694, here after 694).

The Examiner has rejected Claim 11 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 1 as discussed above, they do not teach a method of deposition a TERA layer (comprises Si, C, O, H) [column 4 lines 12-24] on a substrate; 167 does not specifically teach the deposit rate of the bottom portion of the TERA layer is about 100-10000 *Å*/min. 694 teaches a method of deposition of organosilicate layers [abstract lines 1~2] wherein the deposit rate of the organosilicate material is in the range of 1000-20000 *Å*/min [0055 lines 12-14]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer in which the deposition rate of the TERA layer is 100-10000 *Å*/min, because 694 teaches it is suitable to deposit TERA layer with these deposition rate.”

The Examiner has rejected Claims 10 and 12 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 9 above, 167 teaches a method of deposition a TERA layer (comprises Si, C, O, H) [column 4 lines 12-24] on a substrate. They do not specifically teach the deposition time for depositing the bottom layer is between 5-18 seconds. 694 teaches a method of deposition of organosilicate layers [abstract lines 1-2] wherein the deposit rate of the organosilicate material is 20000 *Å*/min [0055 lines 12-14]. 694 further teaches the thickness of the layer is about 3000 *Å* [0057 lines 4]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer in which the deposition time of the bottom TERA layer is about 9 sec, because 694 teaches within this time the thickness of the TERA layer is appropriate.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claims 10-12 should be withdrawn because Claims 10-12 are dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, 963, and 694.

The Examiner has rejected Claim 18 asserting that:

“167, Lee, 115, and 963 teach the limitation of claim 15 as discussed above and 167 further teaches a method of deposition a TERA layer (comprises Si, C, O, H) [column 4 lines 12-24] on a substrate which meets the limitation of claim 15 as discussed above. They do not specifically teach the processing gas comprises CH₄. 694 teaches a method of deposition of organosilicate layers [abstract lines 1-2] wherein the processing gas comprises CH₄ [0053 line 3]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer in which the processing gas comprises CH₄, because 694 teaches methane is a suitable gas for deposition of organosilicate layer.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 18 should be withdrawn because Claim 18 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, 963, and 694.

The Examiner has rejected Claim 25 for the same reason claim 11 is rejected [also see ref. 167, 0064 lines 2-5].

The Examiner has rejected Claim 26 for the same reason claim 12 is rejected [also see ref. 167, 0064 lines 2-5].

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claims 25 and 26 should be withdrawn because Claims 25 and 26 are dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, 963, and 694.

The Examiner has rejected Claim 30 under 35 U.S.C. 103(a) as being unpatentable over M. Angeopoulos et al (U. S. Patent: 6316167, here after 167), Shyh-Dar Lee et al (U. S. Patent Application: 2003/0228750, here after Lee), Kamal Kishore Goundar et al (U. S. Patent Application: 2004/0147115, here after 115), and Alfred Grill et al (U. S. Patent: 6497963, here after 963), as applied to claim 27 above, further in view of A. Grill, Journal of Applied Physics, Vol. 93 (2003) 1785-1790, here after Grill.

The Examiner asserts that:

“167, Lee, 115, and 963 teaches limitation of claim 27, as discussed above. They do not teach the precursor comprises TMCTS. Grill teaches a method for depositing

SiCOH by PECVD when the precursor is TMCTS [column 2 line 4 and 27, page 1785]. (mixing with inert gas (column 1 line 6 page 1786). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method for depositing SiCOH film via PECVD that 167 teaches when the precursor is TMCTS, because Grill teaches it is suitable to use TMCTS for depositing SiCOH film via PECVD process.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 30 should be withdrawn because Claim 30 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, 963, and Grill.

The Examiner has rejected Claim 22 under 35 U.S.C. 103(a) as being unpatentable over M. Angeopoulos et al (U. S. Patent: 6316167, here after 167), Shyh-Dar Lee et al (U. S. Patent Application: 2003/0228750, here after Lee), Kamal Kishore Goundar et al (U. S. Patient Application: 2004/0147115, here after 115), and Alfred Grill et al (U. S. Patent: 6497963, here after 963), as applied to claim 9 above, further in view of Craig A. Roderick (U. S. Patent: 6074488, here after 488).

The Examiner asserts that:

“167, Lee, 115, and 963 teach the limitation of claim 9 as discussed above. They do not teach the DC voltage is applied to an electrostatic chuck. 488 teaches a method of plasma deposition [column 10 lines 42-46] where a DC voltage applied to the electrostatic chuck [column 2 lines 58-60]. He further teaches the DC voltage is about 200-2000 Volts [claim 32]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of plasma deposition wherein the DC voltage to an electrostatic chuck of about 200-2000 Volts to hold the substrate and generate plasma, because 488 teaches it is desirable to deposit material on a surface by such a plasma processing to eliminate extraneous components [column 2, lines 55-65].”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claim 22 should be withdrawn because Claim 22 is dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, 963, and 488.

The Examiner has rejected Claims 37-38 under 35 U.S.C. 103(a) as being unpatentable over M. Angeopoulos et al (U. S. Patent: 6316167, here after 167), Shyh-Dar Lee et al (U. S. Patent Application: 2003/0228750, here after Lee), Kamal Kishore Goundar et al (U. S. Patient Application: 2004/0147115, here after 115), and Alfred Grill et al (U. S. Patent: 6497963, here after 963), as applied to claim 1 above, further in view of Tae K. Won (U. S. Patent Application: 2003/0044621, here after Won).

The Examiner asserts that:

“167, Lee, 115 and 963 teach a method of deposition a TERA layer (comprises Si, C, O, H) [column 4 lines 12-24] on a substrate which meets the limitation of claim 1, as discussed in the 35 U.S.C. 102(b) rejection above, they do not teach controlling the chamber wall temperature. Won teaches a method of deposition of organosilicate layers [abstract lines 7-9] wherein where the chamber wall temperature is controlled [0051 lines 11 to the end] in order to obtain uniform film [claim 2 lines 7-10], Won further teaches the temperature is between 380-410 °C [claim 2 line 9-10]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer in which chamber wall temperature is controlled and is between 380-410 C, because Won teaches the deposited film will be uniform with controlling the chamber temperature between 380-410 C.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claims 37-38 should be withdrawn because Claims 37-38 are dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, 963, and Won.

The Examiner has rejected Claims 39-40 under 35 U.S.C. 103(a) as being unpatentable over M. Angeopoulos et al (U. S. Patent 6316167, here after 167), Shyh-Dar Lee et al (U. S. Patent Application: 2003/0228750, here after Lee), Kamal Kishore Goundar et al (U. S. Patient Application: 2004/0147115, here after 115), and Alfred Grill et al (U. S. Patent: 6497963, here after 963), as applied to claim 1 above, further in view of Zheng .Yuan (U. S. Application: 2002/0163028, here after Yuan).

The Examiner asserts that:

“167, Lee, 115 and 963 teach the limitation of claim 1, 167 further teaches a shower head assembly is coupled to the chamber [120 fig. 2 and 0027 lines 3-5]. None

of the above references specifically teach the temperature of the showerhead. Yuan teaches a method for depositing film on a substrate [abstract lines 1-2, 0007 lines 1-4], where the temperature of showerhead is about 90-120 C [0040 lines 3-12], to enhance the reaction time between the species. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer in which the showerhead temperature is controlled and is between 90-120 C, because Yuan teaches it enhance the reaction time between the species.”

The Examiner has rejected claim 40 asserting that:

“167, Lee, 115,963 and Yuan teach the limitation of claim 38, as discussed above. 167 further teaches a shower head assembly is coupled to the chamber [120 fig. 2 and 0027 lines 3-5]. Yuan teaches a method for depositing film on a substrate [abstract lines 1-2, 0007 lines 1-4], where the temperature of showerhead is about 90-120 C [0040 lines 3-12], to enhance the reaction time between the species. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method of deposition of TERA layer in which the showerhead temperature is controlled and is between 90-120 C, because Yuan teaches it enhance the reaction time between the species.”

The Applicants have amended Claim 1 to more clearly recite the invention and believe the “35 U.S.C. 103(a)” rejection of Claims 39-40 should be withdrawn because Claims 37-38 are dependent from amended Claim 1, and the Applicants believe that amended Claim 1 is patentable over 167, Lee, 115, 963, and Yuan.

The Applicants believe that the Examiner’s “35 U.S.C. 103(a)” rejections are based on improper hindsight reasoning and are improper because the Examiner is using “knowledge gleaned only from applicant’s disclosure” to make the rejections. In re McLaughlin 443 F.2d 1392, 1395, 170 USPQ 209, 212 (CCPA 1971).

Each of the Examiner’s rejections having been addressed, the Applicants respectfully submit that Claims 1, 3-18 and 20-41 are now in a condition for allowance. Given the above remarks, independent claims 1, and 41 as amended, are now in condition for allowance. The dependent claims 3-18 and 20-40 are similarly in condition for allowance as they incorporate limitations from independent claim 1.

In light of the comments above, the Applicant respectfully requests the allowance of claims 1, 3-18, and claims 20-41.

If the undersigned agent has overlooked a teaching in any of the cited references that is relevant to the Allowability of the claims, the Examiner is requested to specifically point out where such teaching may be found. Further, if there are any informalities or questions that can be addressed via telephone, the Examiner is encouraged to contact the undersigned agent at 480-539-2105 or by email at jim.klekotka@us.tel.com.

Charge Deposit Account

Please charge our Deposit Account No. 50-3451 for any additional fee(s) that may be due in this matter, and please credit the same deposit account for any overpayment.

Respectfully submitted,

/James Klekotka/

Date: 12/30/2008

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